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Your reference PC Card Antenna II

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Request for grant of a Patent

Form 1/77 Patents Act 1977

1 Title of invention

ANTENNA FOR A WIRELESS DEVICE

2. Applicant's details

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4 Reference Number

PC Card Antenna II

5 Claiming an earlier application date

An earlier filing date is claimed:

Yes ☐ No ☐

Number of earlier application or patent number

Filing date

15 (4) (Divisional)	8(3)	12(6)	37(4)
☐	☐	☐	☐

6 Declaration of priority

Country of filing	Priority Application Number	Filing Date
GB	9926984.7	15/11/1999

7 Inventorship

The applicant(s) are the sole inventors/joint inventors

Yes ☐ No ☒

8 Checklist

			Continuation sheets
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Priority Documents

Translations of Priority Documents

Patents Form 7/77

Patents Form 9/77

Patents Form 10/77

9 Request

We request the grant of a patent on the basis of this application

Signed: Origin Date: 14 Jan 2000

(Origin Limited)

Antenna for a wireless device

Field of the invention

This invention relates to an antenna for a wireless device. The term 'wireless device' used in this specification refers to any electronic device which includes a wireless reception and/or transmission capability, irrespective of whether or not other (e.g. wire based) forms of communications capabilities are also supported.

Description of the Prior Art

Providing a conventional notebook computer with wireless communications capabilities can be done in several ways, including for example, the use of a GSM PC card inserted into the PC Card bay of the notebook computer. One design limitation affecting wireless devices, such as wireless enabled notebook computers, is that an antenna generally has to protrude significantly from the wireless device casing, since that casing is usually metal and would therefore screen incoming and outgoing radiation. Hence, an antenna formed on a PC card also has to extend significantly from the metal casing of the PC card when in use.

Conventionally, this has led to 3 kinds of antenna designs for wireless devices: first, antennas which are permanently connected to their associated radio receiver/transmitter hardware but are hinged and can fold out of a casing for use. An example of this would be a PC Card with a small hinged antenna which is hinged flush with the top of the PC Card when not in use, so that the antenna extends only slightly from the casing of the notebook computer into which the PC card is inserted. FM radios typically also use a hinged, telescopically extensible antenna. When wireless communications are required, the antenna can be hinged outwards and extended as required. A second kind of design is an antenna which is removable when not in use but which can be readily connected for use. An example would be a clip-on antenna for a PC card offering wireless capabilities: a small antenna connects to the PC card body via a high quality electrical connector. The

third kind of antenna is the permanently fixed antenna, for example the stub antenna as commonly found on mobile telephones.

These approaches all have disadvantages: the hinges of hinged antenna can often be readily damaged; removable antenna can be too readily lost and permanently fixed antennas are susceptible to damage. Another disadvantage with conventional designs is that the electrical connectors leading from the antenna to the radio receiver/transmitter circuitry have to carry radio frequency signals with high integrity and are therefore relatively expensive, high quality components.

The requirement to provide wireless communications capabilities to electronic devices will become increasingly important as wireless communications becomes ever more pervasive. For example, recent developments in technology, such as Bluetooth, offer the possibility of connecting devices such as PDAs and laptop computers; Bluetooth enabled computers and peripherals will likely become popular wireless devices, able to transmit and receive wireless data to other Bluetooth enabled equipment, such as other computers and peripherals. Antennas which can work with Bluetooth signals require high integrity electrical connections, so that the conventional solutions would be particularly expensive because of the required high quality of the components.

Statement of the Invention

In a first aspect of the invention, there is provided an antenna for a wireless device, the antenna being mounted on a platform in a casing, the casing being positionable in whole or part inside of the device and being entirely removeable from the device, the platform being retractable into the casing when the antenna is not in use and being extendable out of the casing and away from the device to enable the antenna to operate effectively, and in which some or all of the signal processing circuitry handling signals to and from the antenna is also mounted on the platform.

Because the antenna is mounted on a platform retractable into a removeable casing, shared with some or all of the signal processing circuitry (e.g. wireless receiver and/or transmitter circuitry), it is both easy to install, robust when extracted, harder to lose than conventional removeable antenna and may also be fully retractable within the casing when not in use. The platform can be a printed circuit board. The platform need not be a single unitary piece: the only requirement is for the part of the platform on which the antenna is attached to be fixed relative to the part of the platform on which the circuitry is mounted. Another advantage of mounting the antenna in very close proximity to the related signal processing circuitry is that no expensive interconnection cable between antenna and circuitry is required: the required electrical connections can for example be a simple rigid connection such as a connection printed directly onto the printed circuit board on which the circuitry and the antenna are mounted. The wireless receiver and/or transmitter circuitry is itself connected to data processing circuitry within the casing of the device via cheap and robust data cabling, such as ribbon cabling. Hence, the only significant cabling in such an embodiment is ribbon cabling, rather than the expensive, high integrity cabling needed to carry a wireless signal.

In a preferred embodiment, the platform slides within a PC Card casing. Since PC card slots are virtually standard in notebook and laptop PCs, this is a particularly convenient implementation since it means that a full functional radio transceiver, for example a wireless LAN transceiver, can be fitted to a wide range of devices. Conventional wireless LAN antennas are somewhat delicate and readily broken, so that the robust solution offered by this embodiment is an attractive one. The card may slide out under the force of a spring ejection mechanism, have a motorised ejector or be merely pulled out manually.

In another aspect, there is provided a PC Card including an antenna which is slidably mounted within the casing. By providing an antenna on a slidable mounting, the antenna even when extended is robust and cannot get lost. The antenna may be mounted on a slidable platform which may include some or all receiver/transmitter circuitry.

In all of the above aspects, the receiver/transmitter circuitry may include not only the analogue circuitry but also the DSP chip as well; this removes the need to locate a separate DSP chip within the body of the computer and means that an entirely self-contained PC Card shaped device can be produced which is compatible with and can be fitted into any computer with a standard slot opening, such as a PC card bay. There is therefore no requirement to design a custom slot within a computer to accommodate such an antenna.

Brief Description of the Drawings

The invention will be described with reference to the accompanying drawings, in which Figure 1 is a perspective view of a PC Card embodiment of the present invention with an integral signal processor module/antenna fully retracted and Figure 2 shows the same card with integral signal processor module/antenna fully extended.

Detailed Description

Referring now to the figures, a standard PC Card casing 1 contains a section 2 which can slide in and out of the casing 1 by approximately 10 or 12 mm. Mounted within the slidable section 2 is a PCB which acts as a platform. The antenna occupies the first 10mm approximately of the section 2, and is therefore fully exposed when the section 2 is fully extended out of the casing 1. The antenna is printed onto the PCB, with a printed connection to a radio transceiver. Other conventional components are also mounted onto the PCB, such as a flash memory and light emitting diodes. The slidable section 2 is electrically connected via a ribbon cable to a connector mounted on a PCB within the

casing 1 that contains data processing circuitry, PC Card interface circuitry and PC Card connector; that ribbon connector carries all digital data traffic from the radio transceiver. The PC Card 1 includes a standard PC Card interface which allows data communication between the radio transceiver module within section 2 of the card 1 and the device into which the PC Card is inserted. That device will typically be a laptop or notebook computer, but can be any kind of computing or communications device.

Card 1 can be inserted into a standard PC Card slot. When the antenna is to be used, it can be readily extended as small springs are mounted behind the rear face of the slidable section 2 and the casing 1; by releasing a catch, the slidable section will be moved forwards into a position in which the antenna is fully extended.

The antenna position (in or out) is used to control the status of device: for example, when the antenna section 2 is retracted, the radio transceiver is automatically switched off (saving power, or for quick disabling as may be required, for example, on an aeroplane). The switch off will be properly designed so that all appropriate switch off protocols are followed – e.g. remotely connected devices know that the device is being turned off in a controlled manner. When antenna section 2 is extended, then the radio transceiver is automatically switched back on. This can be via a simple micro-switch. One advantage of this approach is that it does not require any software application to switch on/ off the radio and the status of the radio is immediately visible to a user. It should be noted that the general principle of an antenna which automatically switches on a radio when it is extended or otherwise positioned for use, is a general one and not limited to the context of an antenna in accordance with the present invention.

The antenna section 2 housing that encloses the module PCB is made from a translucent material such that the antenna appears to light up, using a LED. A blue LED is desirable where the antenna is used for Bluetooth. The light is used to convey device status

information: again, it is very useful for a user to be reminded visually of the status of the antenna device.

LED(s) are used in the section 2 antenna module to indicate the status or condition of the device, for example the received signal strength, link status, and data flow. The LEDs can be modulated in intensity (for example the stronger the received signal, the brighter the LED), or on/off duty cycle (for example the stronger the received signal, the more rapidly the LED blinks, or is on for longer). The LED can for example pulse on for a short period each time a specified amount of data is transmitted or received. The user could specify which status each LED indicates and the means by which this is indicated. A combination of LEDs or multi-colour LED can be used to indicate status, for example colour could be varied from red, through orange to green could be used to indicated signal strength from none, weak through to strong.

LEDs cannot be mounted at the edge of the antenna module as the electrical connections to the LEDs will interfere with the antenna. The solution in the present invention is to mount the LEDs on the module PCB away from the antenna and use light pipes to bring the light signals out to an aperture in the front, safely passing over/alongside the antenna itself.

Claims

1. An antenna for a wireless device, the antenna being mounted on a platform in a casing, the casing being positionable in whole or part inside of the device and being entirely removeable from the device, the platform being retractable into the casing when the antenna is not in use and being extendable out of the casing and away from the device to enable the antenna to operate effectively, and in which some or all of the signal processing circuitry handling signals to and from the antenna is also mounted on the platform.

2. The antenna of Claim 1 in which the platform is a printed circuit board.

3. The antenna of Claim 2 in which electrical connections between the antenna and the signal processing circuitry are printed directly onto the printed circuit board on which the circuitry and the antenna are mounted.

4. The antenna of Claim 3 in which the antenna is printed directly onto the circuit board.

5. The antenna of any preceding claim in which the platform slides within a PC Card casing.

6. The antenna of any preceding claim in which the platform may slide out under the force of a spring ejection mechanism, the force of a motorised ejector or be capable of being extracted manually.

7. An antenna control switch which controls the status of a wireless device in dependence on the position of an antenna of the wireless device.

8. The antenna control switch of Claim 7 which controls the status of the wireless device transceiver to be automatically switched on when the antenna is in an extended position and automatically switched off when the antenna is retracted.

9. The antenna of any preceding Claims 1- 6 switched by the antenna control switch of Claim 7 or 8.

10. A PC Card including an antenna which is slidably mounted within the casing of the PC card.

11. The PC Card as claimed in Claim 10 including an antenna as claimed in any of Claims 1 – 6 and Claims 9.

12. The PC Card as claimed in Claim 10 or 11 further including LEDs which are controlled to light up indicating the status or condition of the Card.

13. The PC Card of Claim 12 in which the LEDs are mounted distant from the antenna in order to minimise interference with the antenna and there is one or more light pipe carrying light form the LEDS to an aperture in the casing of the PC Card.

14. The PC Card of any of Claims 12 - 13 in which the casing is made in whole or part of a translucent material.

Abstract

Antenna for a wireless device

A PC Card contains an antenna which is mounted on a platform which is retractable into the PC Card casing when the antenna is not in use and, when in use, is extended out of the casing and therefore out of the device in which the PC Card is itself inserted. Some or all of the signal processing circuitry is also mounted on the slidable platform. Because the antenna is mounted on a retractable platform, shared with some or all of the wireless receiver and/or transmitter circuitry, it is both robust when extended, cannot be lost, is fully retractable within the casing when not in use and requires only cheap and simple printed connections to the signal processing circuitry.

Figure 1

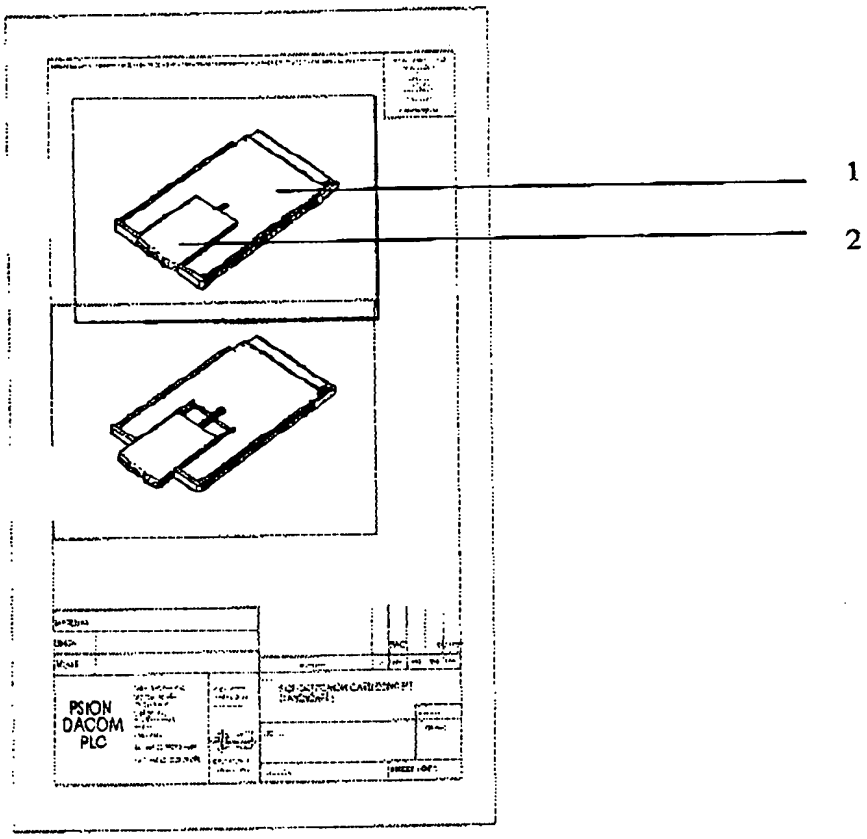

Figure 2

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